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Quiet War Rages on Technology's Front Line

Companies Pool Resources for Computer Breakthrough

By Robert L. Simison
Staff Reporter of The Wall Street Journal

AUSTIN, Texas—This is what it's like on the front lines of the high-technology war with Japan and Europe:

A bearded scientist puffs on a pipe and stares out his window to the Texas hill country beyond. In another room of a modern complex here, a portly researcher eats popcorn while typing computer code. Three scientists in a darkened office huddle silently around a computer screen, its glow illuminating their furrowed brows.

But if the hushed, cerebral atmosphere of these buildings seem more like a public library than a battlefield, look closer. This is the home of Microelectronics & Computer Technology Corp., a research group that hopes to ride the mental exertions of its 282 scientists to the forefront of U.S. computer research.

Besides the usual cramming of tiny circuits onto tiny silicon chips, the researchers' wide-ranging ruminations include how to give computers more than a one-track mind and inquiries into human psychology and the nature of common sense. This is supposed to result in technologies that will enable future computers to handle more data faster and more easily, giving them capabilities far beyond those of today's machines.

Long-Range Payoff

Plenty of big computer companies are working on the same things. But what sets apart MCC, as the group calls itself, is that it is a cooperative research venture owned by 21 computer and electronics companies. None of them could afford such a comprehensive, long-range effort alone. The payoff may take 10 years, the intended lifespan of the project. And MCC is in a high-stakes race with research efforts sponsored by the Common Market and the governments of France, Britain, West Germany and—most notably—Japan.

Unlike the Japanese project, MCC isn't trying to invent one new computer. Rather, it is attacking seven specific technological problems in hopes that the results will enable its owners to build next-generation computers and electronic devices. The projects represent the biggest bottlenecks in computer research: artificial intelligence, semiconductor packaging, database management, parallel processing, software technology, computer-aided design of integrated circuits and interaction between people and computers.

"This is a vital effort," says D. Bruce Merrifield, assistant U.S. secretary of commerce for productivity, technology and innovation. "The Japanese have targeted this area for capturing. Our answer must be to use our advanced technology to leapfrog them, and that is what MCC is all about."

Increase in Research Outlays

MCC's progress so far has been promising. Since its formal launch in January 1983, the group has assembled a highly respected staff, initiated the seven research projects and started to send technological nuts and bolts back to its shareholders. The price of a share has leaped from an initial $150,000 to $1 million. Nine additional shareholders have joined the original 12 and all, so far, have expressed satisfaction with the venture. In another year, MCC hopes to add 100 more scientists. And despite the computer industry slump, its owners next year expect to boost research spending to between $65 million and $70 million from this year's $55 million. Estimates of total research spending over the 10 years range from $600 million to $700 million.

Despite the progress, the jury is still out. Skeptics question MCC's strategy of focusing on high-risk, long-range research goals rather than trying to solve more immediate problems. Others voice doubts that an organization run by 21 corporate owners, each with different interests, can conduct first-class research. Several scientists have left the group, with at least one questioning MCC's research strategy. And MCC officials themselves worry that some shareholders may not be prepared to use research results quickly.

Nonetheless, MCC apparently is at least holding its own with the much-ballyhooed Japanese government-backed next-generation computer project, MCC insiders and outsiders familiar with both programs think. It was feared that the U.S. would fall behind on developing the next generation of computers that led to MCC.

'Losing Market Share'

"In the high-technology markets of the world, we are losing market share," says William C. Norris, chairman and chief executive officer of Control Data Corp., an MCC shareholder. Mr. Norris proposed MCC in 1982 as a pooling of several companies' research efforts. At MCC, the participating companies receive complete reports on the areas of research that they help fund. Control Data, for example, calculates that for its $13 million in MCC outlays over the first three years it is getting $120 million of research results.

But MCC's broadest significance may be in helping foster cooperative research in the U.S. For companies even to consider pooling research efforts in the past was considered anticompetitive. But as competition has grown increasingly international, that thinking has changed.

Congress last year sought to clear the way by passing the National Cooperative Research Act, which generally limits joint research ventures' potential antitrust liability. Already this year, 38 cooperative high-technoloy research projects, including steelmaking and telecommunications, have registered under the act with the Justice Department. The department conducted a 23-month antitrust investigation of MCC before clearing it last March.

"MCC makes leading-edge technology available to small and medium-sized companies that can't afford to be involved in long-range research but do tend to bring products to market much faster," says retired Adm. Bobby R. Inman, president and chief executive officer of MCC.

Adm. Bobby Inman

MCC doesn't include International Business Machines Corp. and American Telephone & Telegraph Co., each of which supports research programs many times the size of MCC. Besides Control Data, 11 other concerns helped start MCC: Advanced Micro Devices Inc., Allied-Signal Inc., Digital Equipment Corp., Harris Corp., Honeywell Inc., United Technologies Corp., Motorola Inc., National Semiconductor Corp., NCR Corp., RCA Corp. and Sperry Corp. Nine others since have bought in: Bell Communications Research, BMC Industries Inc., Boeing Co., Eastman Kodak Co., Gould

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Inc., Lockheed Corp., Martin Marietta Corp., Minnesota Mining & Manufacturing Co. and Rockwell International Corp.

Developing Mystique

MCC has developed a certain mystique among computer scientists. "This place has charisma—Bobby Inman and MCC, that's the place to be," says Woodrow W. Bledsoe, director of MCC's artificial intelligence program.

Like some of MCC's other senior researchers, Mr. Bledsoe is one of the leading lights in his field. A former University of Texas professor, he is past president of the American Association of Artificial Intelligence. Computer science experts say he attracted some of the brightest scientists in his field, as have most of MCC's other program directors. Nearly half of MCC's researchers, including Mr. Bledsoe, hold doctorates. Few, according to Mr. Inman, came from the group's sponsors. "Companies are reluctant to let go of their very best talent," he says.

Besides mystique, MCC also means good money. Salaries run into six figures for top scientists and rank among the highest in computer research. In addition, MCC offers cash bonuses for meeting specific research goals. But "this isn't a sandbox," says George D. Black, vice president for human resources. Those who don't meet their research goals are asked to leave; so far there have been four such departures, he says.

MCC's approach to some of the its seven research areas more closely resembles psychological research than traditional computer science. One-third of a 20-scientist group studying how to make computers easier to use hold doctorates in psychology. The group seats subjects at a computer, assigns them a task and then observes their struggles from behind one-way glass as video cameras roll.

Raymond W. Allard, director of the "human factors" program, volunteered as one of the guinea pigs. "I got very frustrated and angry and had a stomach ache afterward," he says.

'Corporate Politics'

In MCC's parallel processing program, "It was difficult to set directions because of corporate politics and whimsy," says Peter C. Patton, director of the Minnesota Supercomputer Institute at the University of Minnesota, who resigned for personal reasons earlier this year as director of the parallel processing program.

For example, Mr. Patton says, he favored trying to understand the fundamental problem of programming a computer that uses several data processors to solve different parts of a problem at the same time, rather than using just one as today's computers do. But the shareholders sought to steer the program in other directions. "Most people think parallel processing is the future, but nobody can agree on how to get there," Mr. Patton says.

"The too-many-cooks syndrome is always there," says Walter Fredrickson, a vice president of Harris Corp.'s information systems sector. He says that shareholders at first tried to impose too many conflicting ideas on the program before settling on a consensus strategy. "If you aren't careful, you could end up with something built by a committee," he says.

To some critics, that is MCC's most likely downfall. "They seem to think too narrowly," says Terry A. Welch, manager of research at International Software Systems Inc. Mr. Welch, who recently left MCC after working in two projects, faults the idea of splitting into separate programs research areas that may overlap. He adds that "their strategy of focusing only on the long-term entails a high risk that they may not produce results that will be relevant."

Strong Leader

MCC shareholders acknowledge that as a legitimate concern but maintain that formal quarterly program reviews by experts from each company are intended to keep the research on-track. Moreover, the founders say they deliberately picked a strong leader. "Admiral Inman has an unusual ability to get a diverse group of people with different interests to follow him," says Gregory Harrison, a vice president of National Semiconductor Corp.

Some MCC programs are contributing a trickle of ideas and bits of software that shareholders are using. The data base program has published about 60 research papers. The computer-aided design program expects to be running experiments in less than a year on a system capable of designing highly complex microcircuits. And the semiconductor packaging program is beginning to deliver a system intended to solve manufacturing problems related to the use of integrated-circuit chips with 200 leads or more, about double the number permitted by present technology.

Despite skepticism about the group, leading computer scientists do credit MCC for taking on some risky projects. In an office cluttered with encyclopedias and rocks, Douglas B. Lenat is bent on teaching a computer common sense. The problem with most of today's artificial-intelligence systems, he says, is that "they don't know anything about things every nonfeeble person over the age of four knows." So, he says, "We are trying to put the most-basic 200,000 things everybody knows into a knowledge base. Then it will be ready to learn the other two million things."

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EARL W. FOELL

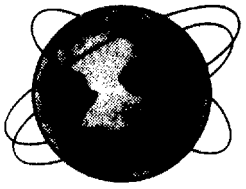
It's morning again for US R&D: joint labs and mollusks with iron teeth

Earl W. Foell is editor in chief of The Christian Science Monitor.

Washington

SUCCESS story:

Two years ago this column dealt with a bill struggling through Congress that was designed to help American industry compete in world markets. That bill's approach was simple. It allowed domestic rivals to form joint research and development consortia. It essentially shielded them from antitrust penalties if they researched new techniques and products *jointly* but produced and marketed them *separately*.



The aim of this little-noticed legislation was to allow domestic competitors to band together to produce: multimillion-bit computer chips, more efficient steel casting processes, safer diesel exhaust, artificial intelligence computers, plastics recycling systems, fuel cells, faster computer software-writing techniques, higher quality TV transmission, a better marriage of telephone and computer networks, and a menagerie of other better mousetraps.

Under century-old antitrust laws such collaboration had been *verboten* and might have subjected transgressors to triple damage suits.

Last year the bill became law. And even its drafters have been surprised at its success since then.

Nearly 50 research & development (R&D) consortia have been registered under the law. Each month two or three are added.

None have been in operation long enough to *prove* that joint research marks a fundamental change in terms of world competition, speedier research, or reducing duplicated efforts. But many R&D specialists believe such proof will come — especially in technologies that require elaborate and super-expensive investment or assembling large teams of scientists and engineers.

Firms that are big enough to hold their own at home in developing new technologies and products often encounter rivals in the global market that benefit from government-supported, multibillion dollar national R&D efforts. The new consortia pool resources where common needs and large size make a unified effort sensible.

A classic example of redundant research that joint R&D would have eliminated involves the automobile pollution-control device. The big US automakers spent billions on separately inventing a public-safety device that gives none of them a competitive sales advantage. Seatbelts, airbags, and safer bumpers fall into the same category.

Not surprisingly, the Motor Vehicle Manufacturers Association and the American Petroleum Institute have registered for joint R&D on exhaust emissions from vehicles not currently covered by pollution-control laws. A seven-member consortium is also exploring diesel exhaust. And a 34-firm consortium has been formed to research the toxic side effects of new chemical products and to train scientists in that field.

Among the more than two score consortia now registered, several are applying high-tech research to low-tech or "old-tech" industries.

One of the most dramatic — and desperately needed — is joint steel industry R&D. Some of that research has concentrated on improving existing lab techniques for continuous casting and rapid solidification of steel. Those processes would save huge amounts of energy, wastage, time, and labor. They would make it possible to cast steel directly in exactly the thickness and alloy blend desired for the finished product.

The extent to which the supposedly stodgy old steel industry is venturing into imaginative new realms of joint research may be seen in one long-shot piece of research. A team of biologists is looking into the possibility of using a marine mollusk to produce iron. Mollusks consume iron salts in seawater to produce iron "teeth" with which to eat food. If genetic manipulation permits multiplication and farming of such creatures, it might be possible to extract dissolved iron from seawater with very low energy use.

One criticism leveled at R&D consortia is that they may rob individual companies of their most talented scientists. Another criticism argues just the opposite: that no firm in its right mind would send its best R&D people to a pool whose results will benefit competitors.

That charge may yet prove valid. But the most noted of the high-tech consortia — the Microelectronics and Computer Technology Corporation (MCC) of Austin, Texas — has gone a long way to answering the criticism. Its chairman, Bobby Inman (former head of the National Security Agency), has pushed hard to get his 21-member companies to give him an open hand in hiring. Industry specialists say he has succeeded. MCC is also hiring some of the brightest young scientists from graduate schools. So is the 33-firm Semiconductor Research Corporation of North Carolina's Research Triangle area.

In fact, one of the most crucial results of the joint R&D law may lie in the stimulus it gives to university-industry research cooperation. And that means attracting more young Americans into scientific and engineering careers — a strong national need.